ENVIRONMENTAL IMPACT STATEMENT 1992

EXECUTIVE SUMMARY

COLLINS BAY A- AND D-ZONES AND EAGLE POINT DEVELOPMENT

Cameco
CORPORATION

Uranerz
Exploration and
Mining Limited

Cover illustration by:
Fred Desjarlais,
Equipment Operator,
Key Lake Operation

Diri t'a Eagle point (tsá desáze chela) Impact Environment statement (EIS) Sí dëne yatíe tth'i ?á thëla eyi bet'á dëne yatíe náltsí k'í t'ok'e thela sí ?eyer Band office (dene sǫ́lághe tsaba huhtón ?erítł'ís k'óní kǫ́ę) chu ?eritł'ís k'e yati kǫ́ę ?eyer hílę dé, háíyorįla ?eritł'ís kǫ́ę nędhé thela ha ?e. ?eyi ha nuhe ts'é di ha. dǘé dé ?alén ?ądą́ bets'en yołti ha ?ędınë yotthé háyorįla náts'e dé ha ?eghálana t'á beyatié hultá sí. T'ok'e hoghálana sí, LaRonge 425-5088.

EYUKO OMU ACHIMOWIN UYUHK EAGLE POINT ENVIRONMENTAL IMPACT STATEMENT (EIS) OHCHI, IHTUKWUN (AUDIO TAPE) ITU MANU ACHIMOWINU IKWU ITWEWINU KA PIHTAKWUHKI, IKWU NIHITHIWEW UWEYUK KA PIHTAKOSIT. IKWU CHUPUSIS OHO KANISINUHIKATEKI OOTENAWU, EKOTU OMU KITUKE NITOHTUM POKAWEYUK (AUDIO TAPE) ITU UNIMU (EIS) KASTEK, ITU MANU KANTUHTAMUHK MUSINUHIKUNU (LIBRARY) IKWU OKIMUHKAN MENU OTHUSIWEW ITINIWUK KA OHCHI UTOSKECHIK (BAND OFFICE) IKWU OTENUHK OHCHI OTOTHUSOWEWUK ITU KATOSKECHIK (MUNICIPAL OFFICE) EKOTU OOMU KITUKE KUKWECHIHKEMO-NANUWIN, IKWU KESPIN EKU, KUKE UYUMIHAWAW MR. ALLAN ADAM EYUKO UWU NORTHERN COMMUNITY LIASON OFFICER E-ITUPIT IKWU LA RONGE KAWEKIT OTUKIHTASIWIN OMETHIW (425-5088)

This summary of the Eagle Point Environmental Impact Statement (EIS) is available as an audio tape in Cree and Dene at those places where the EIS is on public display. Please contact your local library, band office or municipal office. If you cannot get assistance at these places, please contact Mr. Allan Adam, Northern Community Liaison Officer in La Ronge, telephone 425-5088.

Share of ownership in the Rabbit Lake Operation:

Cameco Corporation
66.67%(two-thirds)

Uranerz Exploration and Mining
Limited 33.33% (one-third)

92-05612/

INTRODUCTION

The Rabbit Lake Joint Venture, an undertaking of Cameco Corporation (2/3 owner) and Uranerz Exploration and Mining (1/3 owner), is proposing to proceed with the mining of three new uranium ore bodies at the Rabbit Lake Operation in northern Saskatchewan. Rabbit Lake has been in operation for 17 years, producing uranium for electricity generation in Canada, the United States, Europe and the Far East. The Rabbit Lake pit was mined from 1975 to 1984 and the Collins Bay B-zone pit from 1985 to 1991. The Rabbit Lake mill is currently processing stockpiled ore from the B-zone pit.

In 1987 an Environmental Impact Statement for the mining of the new ore bodies was submitted to the regulatory agencies. After an extensive review, including the public review required by the Saskatchewan Environmental Assessment Act, Saskatchewan issued ministerial approval to proceed. The Atomic Energy Control Board licensed the development of the Collins Bay A-zone and D-zone ore bodies and the test mining of Eagle Point to determine the best mining techniques for production. In 1991, the Atomic Energy Control Board decided that, although the environmental impacts of the project were known and mitigable with known technology, there was sufficient public concern to warrant referral to the Federal Environmental Assessment Review Office for a panel hearing before proceeding to full production.

As a result, the original Environmental Impact Statement (EIS) has been revised to include additional data accumulated over the past four years and to re-assess the socio-economic impacts to reflect economic changes during this period.

REGULATORY CONTROL

In order to operate a uranium mine within the Province of Saskatchewan, both federal and provincial approvals are required. To obtain these approvals, the proponent must perform an environmental assessment, which must be reviewed by the agencies and the public, and produce operating plans and safety procedures to demonstrate the ability to conform to both provincial and federal legislation. Once the mine is licensed for operation, it must conduct monitoring programmes in both the work place and the environment. Regular reports must be filed with several agencies. The facility is inspected regularly by the Saskatchewan Mines Pollution Control Branch, the Saskatchewan Mines Inspectors, the Atomic Energy Control Board, and Environment Canada. Most of these agencies visit monthly, collecting their own environmental and work-place samples for independent analysis. Both federal and provincial agencies regularly review their regulations to ensure that they are adequate. Mine licences are renewable every year or two, resulting in regular reviews of operating performance and the opportunity for the agencies to impose such additional licence conditions as may be deemed necessary, based upon operating experience and changing standards.

PROJECT DESCRIPTION

The new ore bodies, the Collins Bay A-zone and D-zone and the Eagle Point deposit, contain mineable reserves of about 93 million pounds of U_3O_8 with the possibility of additional reserves being defined by underground drilling at Eagle Point (Table 1). Eagle Point is about 13 km north of Rabbit Lake mill and 4 km north of B-zone. A-zone is 2.5 km north of B-zone and D-zone is 0.8 km north of B-zone (Figure 1). Because they are close to B-zone, the new mines would make use of the B-zone facilities. The ore would be processed in the Rabbit Lake mill.

Table 1: A, D and Eagle Point Ore Reserves

	Ore million tonnes	Grade % U_3O_8	U_3O_8 million pounds
Collins Bay A-zone	0.135	5.69	16.9
Collins Bay D-zone	**0.116**	**2.19**	**5.6**
Eagle Point Mineable	3.38	0.94	70.1
Total Mineable	**3.63**	**1.16**	**92.6**
Eagle Point Geological	2.13	0.94	44.5
Total Reserves	**5.76**	**1.08**	**137.1**

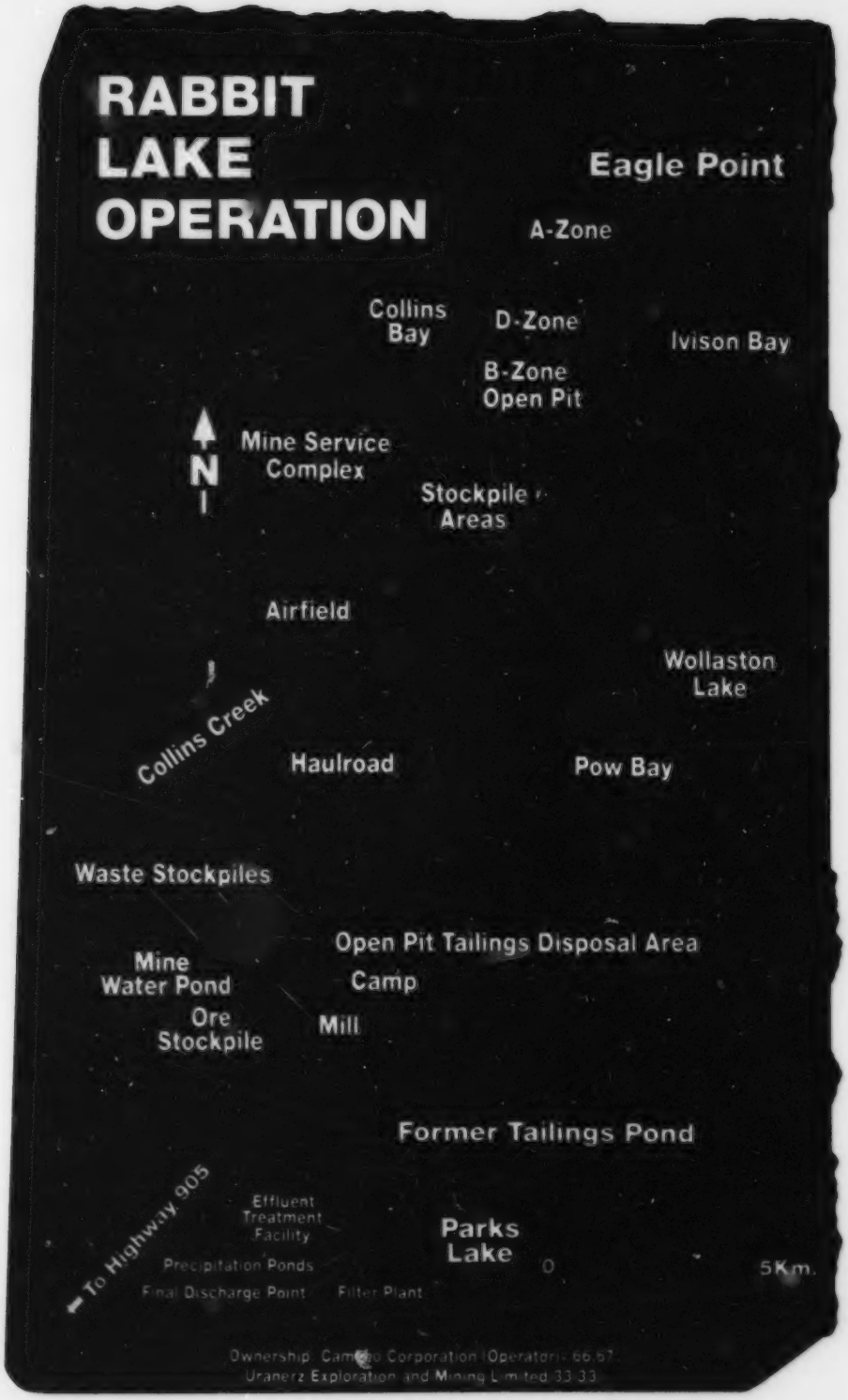

RABBIT
LAKE
OPERATION
Eagle Point
A-Zone
Collins
Bay
D-Zone
Ivison Bay
B-Zone
Open Pit
N
Mine Service
Complex
Stockpile
Areas
Airfield
Wollaston
Lake
Collins Creek
Haulroad
Pow Bay
Waste Stockpiles
Open Pit Tailings Disposal Area
Mine
Water Pond
Camp
Ore
Stockpile
Mill
Former Tailings Pond
To Highway 905
Effluent
Treatment
Facility
Parks
Lake
0
5Km.
Precipitation Ponds
Final Discharge Point
Filter Plant
Ownership: Cameco Corporation (Operator) 66.67
Uranerz Exploration and Mining Limited 33.33

Figure 1

Eagle Point

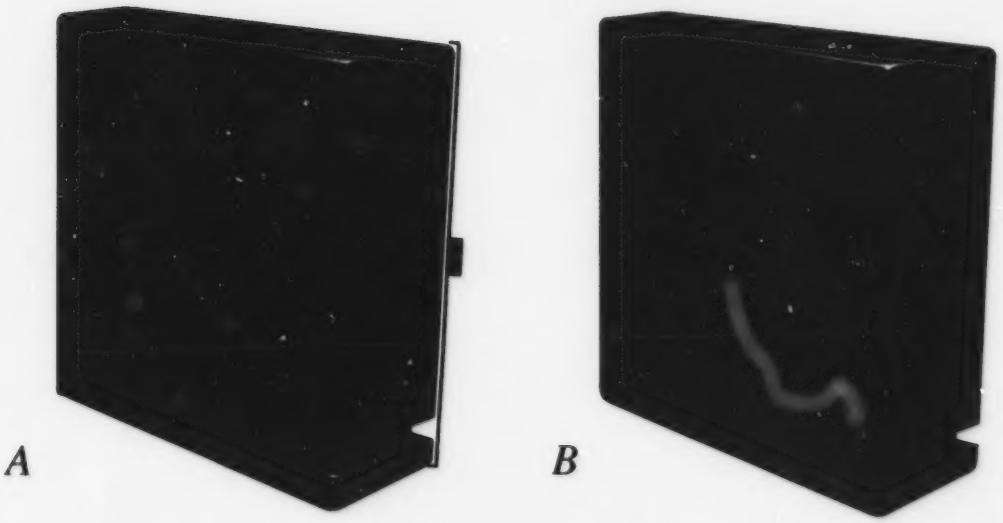
Eagle point is partially under Collins Bay at water depths up to 8 m, but it extends at least 400 m down into the rock below. It is planned to mine this deposit by underground mining techniques. For test mining and underground exploration, access to the mine has been developed by decline, horizontal development has proceeded on two levels, and a ventilation system has been set up using a fresh-air raise and an exhaust raise. Figure 2 shows the lay-out of the test mine.

Because the grade of ore is higher than that in the Rabbit Lake and B-zone open pits, mining methods were examined, which would reduce the direct contact of miners with the ore. This will help reduce radiation exposure. The initial method selected for the test mine is vertical blast-hole stoping with delayed fill (Figure 3). Development work is done in waste rock above and below the ore zone (Figure 3A). Blast holes are drilled through the ore from above, together with a larger hole called a slot raise (Figure 3B). Explosives are placed in the blast holes and detonated, breaking the ore into the slot raise. The broken ore is withdrawn from the bottom of the stope (Figure 3C) and trucked out of the mine. After all the ore is removed, the stope is filled with a mixture of waste rock and cement to stabilize the ground (Figure 3D). Personnel and materials are moved in and out of the mine in rubber-tired vehicles.

It must be recognized that the purpose of a test mine is to find mining methods which are suitable for mining a particular ore body. It is not uncommon to use several different stoping methods in a single mine, adapting to the conditions found in the different ore zones. Hence, it is likely that more than one mining method will be used at Eagle Point.

Figure 3

Eagle Point Mining Method



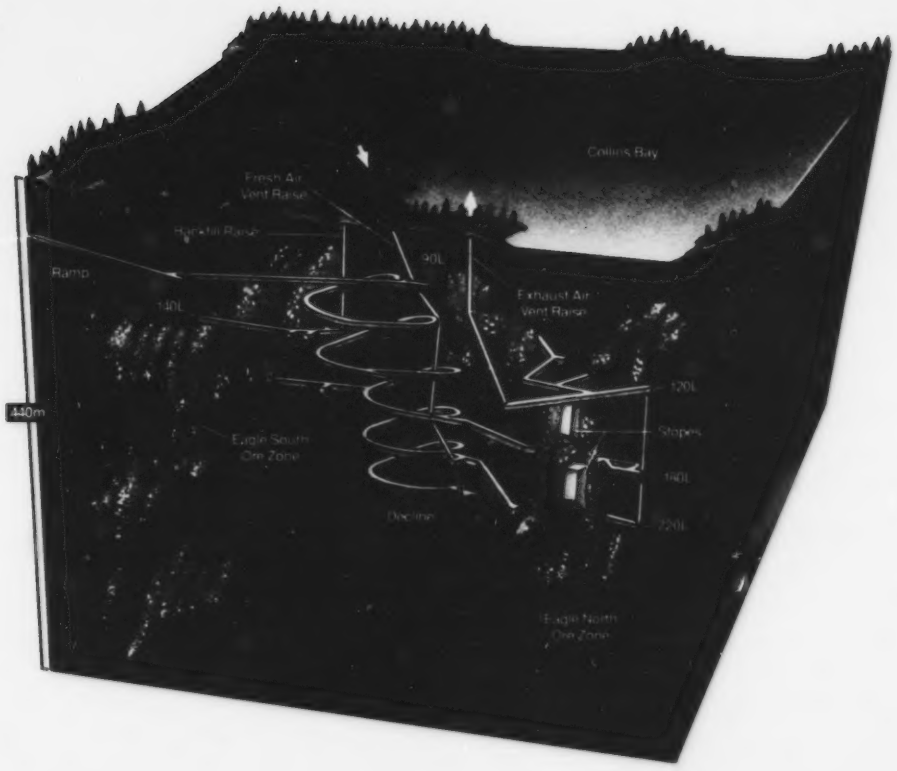


Figure 2

Eagle Point
Underground Mine

C

D

A-zone and D-zone

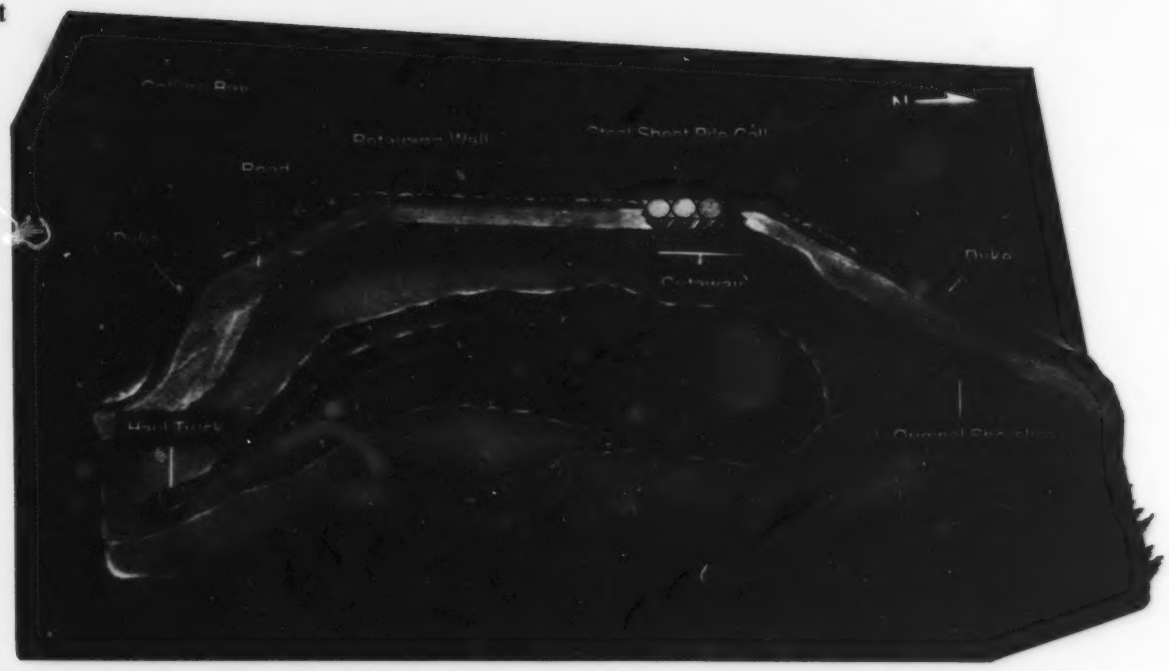
A-zone and D-zone, like the B-zone, are shallow deposits on the shore of Collins Bay and are largely under water. It is proposed to mine these two ore bodies by the same techniques as were used for B-zone. First a dyke would be constructed around each ore body, using rock-filled, steel cells. The water would then be pumped out to permit mining of the ore by conventional open pit methods (Figure 4). Both ore bodies are quite small and it is planned to mine each of them in a single winter, thereby minimizing water problems.

Milling

The existing Rabbit Lake mill circuit will be suitable for processing the ore from the three new ore bodies. The A-zone and D-zone ores are very similar to the B-zone ore, which has been processed successfully since 1985. The Eagle Point ore is a simpler ore, without the nickel and arsenic compounds found in the other three. Thus, milling of Eagle Point ore should be easier and produce a more harmless waste than the tailings from the other three ore bodies.

Figure 4

D-zone Pit



Waste Management

It is planned to dispose of the tailings from the new ore bodies in the Rabbit Lake pit, using the "pervious surround" method, which has been successfully used since 1985 (Figure 5). The objective of this technique is to produce a consolidated, highly impermeable mass of tailings within a highly permeable envelope, beneath the water table. After decommissioning, the ground water will flow by the path of least resistance around the tailings, rather than through them. By draining the tailings during placement, excess pore-water pressure is removed, eliminating the principal driving force for release of contaminants. The only remaining release mechanism, molecular diffusion, is so slow that surface water quality objectives will always be met. The Rabbit Lake pit has sufficient capacity for the current mineable reserves. If additional capacity is needed to accommodate ore which may be confirmed by underground exploration, then the upper benches of the Rabbit Lake pit could be expanded to supply this capacity.

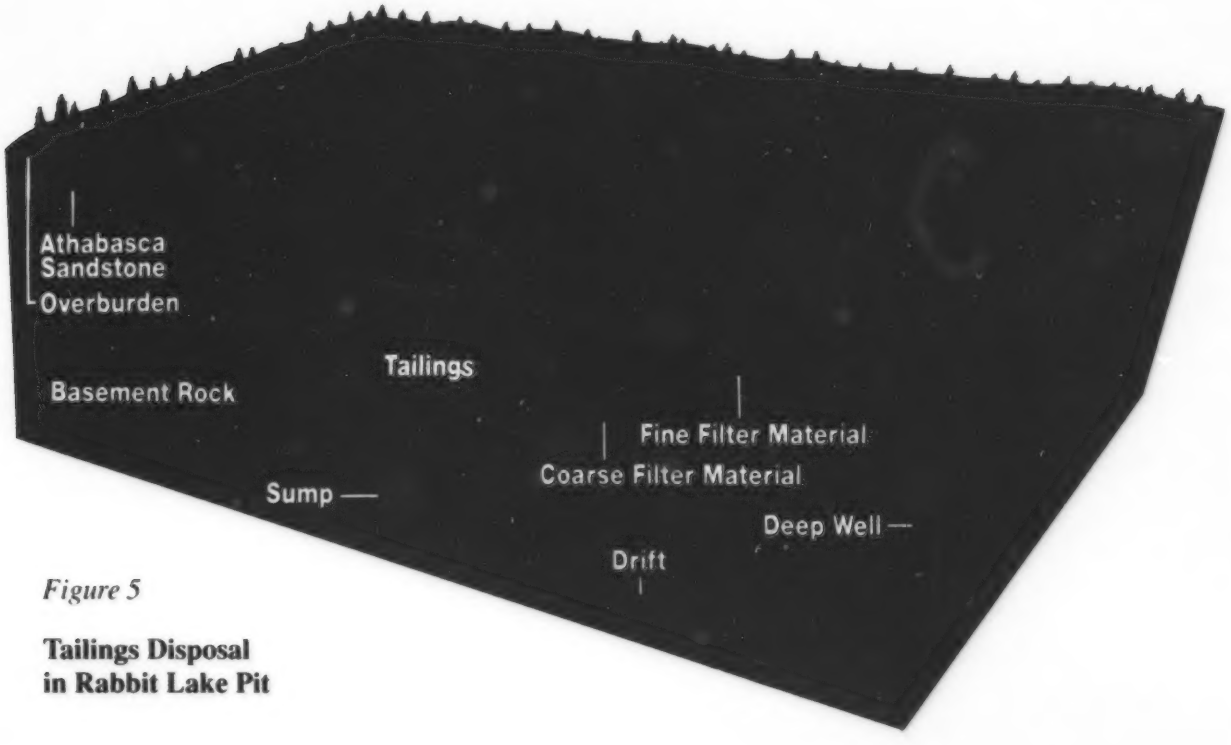


Figure 5

Tailings Disposal in Rabbit Lake Pit

ENVIRONMENTAL IMPACTS

To assess the environmental impact of any project requires an examination of the existing environment, a description of the project, and a prediction of the changes to the environment, which could occur as a result of the project. The assessment of the A-zone, D-zone and Eagle Point development is greatly aided by two factors. Firstly, mining has been going on since 1974 and environmental conditions have been well studied during that time. Secondly, the operation of the B-zone mine and associated facilities has allowed a comparison of the initial predictions done in 1980 with the actual impacts monitored since.

Current Impacts

Effluent Discharges

The review of past operations has shown a steady improvement in levels of emissions and effluent quality over the years of operation. The quality of aqueous waste was improved by the elimination of ammonia from the mill process in 1985. The addition of the pressure sand filters to the effluent treatment system further reduced the concentrations of contaminants in the final discharge. Effluent discharges are well below the licence criteria and have shown a downward trend over the past years.

A new scrubber system, installed with the new yellowcake drying and packing area in 1987, has reduced the concentration of uranium in the gaseous discharge from that area to truly negligible levels.

Over the years of operation, good control of the sulphuric acid plant has continually been demonstrated, both by the continuous stack monitoring and the environmental monitoring.

Environmental Monitoring

Rabbit Lake has maintained an extensive environmental monitoring programme, which has now accumulated 17 years of data.

Aquatic Environment

The water sampling programme has demonstrated no measurable impact on natural waters around the site. A continuous record of water quality sampling in Wollaston Lake has shown no change in lake water quality since the start-up of the operation.

Sediment sampling in the bays immediately adjacent to the operation has shown only very small, local and temporary changes in sediment quantity in Collins Bay at the time of construction of the B-zone dyke. Radionuclide and heavy metal concentrations in the sediments at all locations are comparable with concentrations found in other northern locations.

Although not part of the routine monitoring programme, surveys of the plankton community in local waters around the Rabbit Lake Operation were conducted some years after start-up. The plankton populations were found to be comparable with those found in other northern Shield lakes.

Aquatic plants were sampled twice, approximately five and ten years after the Rabbit Lake start-up. The results obtained showed no particular trends and essentially background levels of radionuclides.

Fish sampling has been an important part of monitoring programmes, although it has been recognized that water quality would have to be significantly affected for a long time before fish would be affected. Because fish are at the top of the aquatic food chain and are consumed by people, the fish programme has been continued. Radionuclide and heavy metal concentrations in fish have remained at the same low levels first detected in the early days of the Rabbit Lake Operation. The fish results are similar to those obtained in other northern lakes and show no trends over time.

Atmospheric Environment

Several environmental air sampling programmes have been in operation at Rabbit Lake over the years. The sulphur dioxide programme has shown that the operation always complies with the annual limit. Occasional excursions above the hourly limit are recorded, but these are usually associated with plant start-ups and represent less than 0.2% of the operating time. Calculated sulphur deposition rates are well below the proposed federal guideline for sensitive areas. The water sampling in seven small lakes around the site has shown no trends in acidity.

The high-volume air sampling programme has shown that dust levels in the ambient air are generally low and well below Saskatchewan criteria. The rare excursions (0.9% of all samples) generally occur during very windy periods, and even when there are measurable concentrations of radionuclides and heavy metals in the air, these are still far below any criteria which are incorporated in environmental legislation or which could be derived from occupational exposure limits with appropriate safety factors.

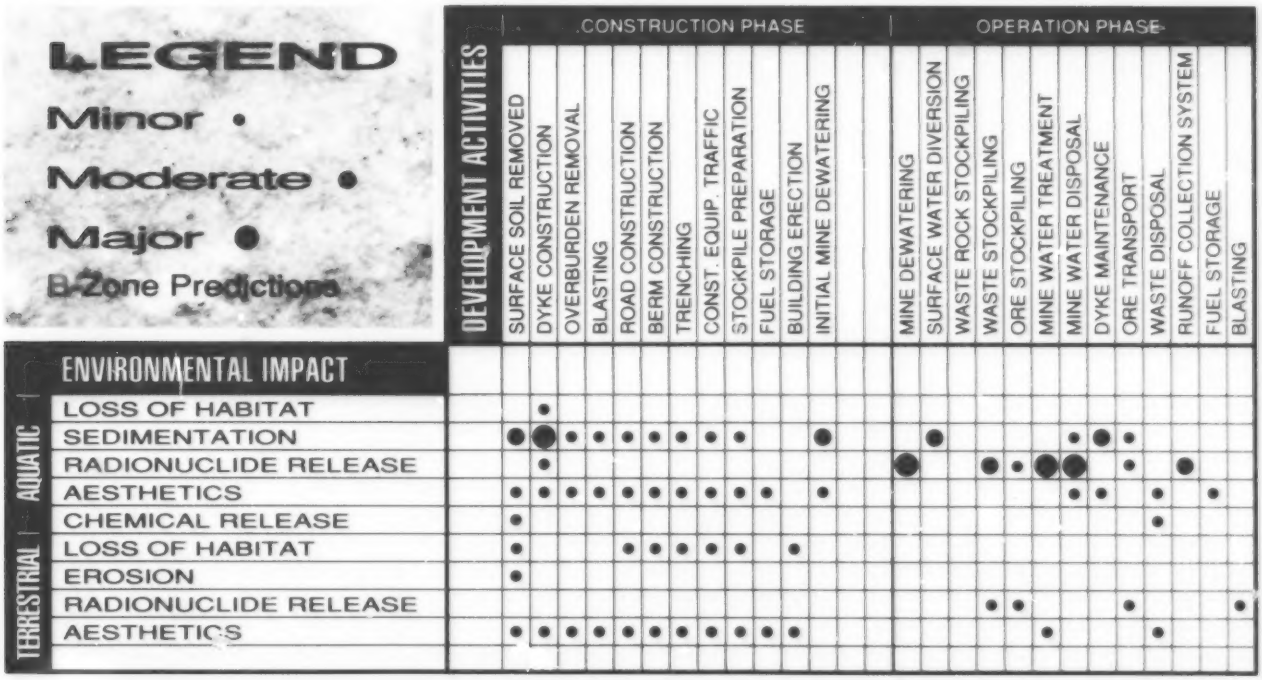
The environmental radon programme has shown measurable concentrations close to the operations, *e.g.* near the ore stockpile and the tailings area, but the effects of the operation are not distinguishable from background concentrations at more than one or two kilometres.

Sampling of lichen has been part of the air monitoring programme for some 13 years. The lichen sampling has shown measurable levels of uranium-chain radionuclides, which decrease with distance from the operation. Statistical analysis of these data indicate that the operation has an area of influence of about five kilometres, beyond which lichen concentrations return to background levels. The exceptions to this are the lead 210 and polonium 210 concentrations, which show almost no trend with distance from the site. This is because these two radionuclides result from the decay of atmospheric radon. The natural radon background is high enough to hide any local variations arising from the operation. Sampling conducted at intervals of several years has shown decreasing levels of uranium and other uranium-chain radionuclides in the lichen over time. These decreases can be correlated with improvements in the control of air emissions from the mill.

B-zone Impacts

Overall, it can be stated that the construction and operation of the B-zone pit has caused environmental impacts substantially less than those predicted in the B-zone EIS. Prior to the start-up of the B-zone development, a thorough environmental assessment was done, which included predictions of the potential environmental impacts (Figure 6). Some major and moderate impacts were predicted for the aquatic environment, related to the construction of the dyke and the handling of mine water and surface run-off. All other impacts were predicted to be minor. When the actual impacts

Figure 6



were assessed after B-zone was operating (Figure 7), it was determined that fewer impacts could actually be identified and that all impacts except noise were minor. Blasting noise was classified as moderate because it could be heard off-site under some conditions. The incorporation of construction and operating practices designed to minimize environmental impacts has been shown to be effective.

Waste Management Impacts

The performance of the "pervious surround" tailings system was predicted as part of the B-zone environmental assessment. The tailings system was subjected to another thorough review in 1990 to assess its impact as part of the application for approval of a change in the tailings deposition method. The conclusions of that review remain valid today.

The containment of contaminants during the operational phase is completely effective. The tailings are consolidating faster than originally predicted and excess pore-water pressure is dissipating faster than predicted. This should allow earlier decommissioning after the pit is filled and may have some additional benefit in terms of slightly improved pit capacity.

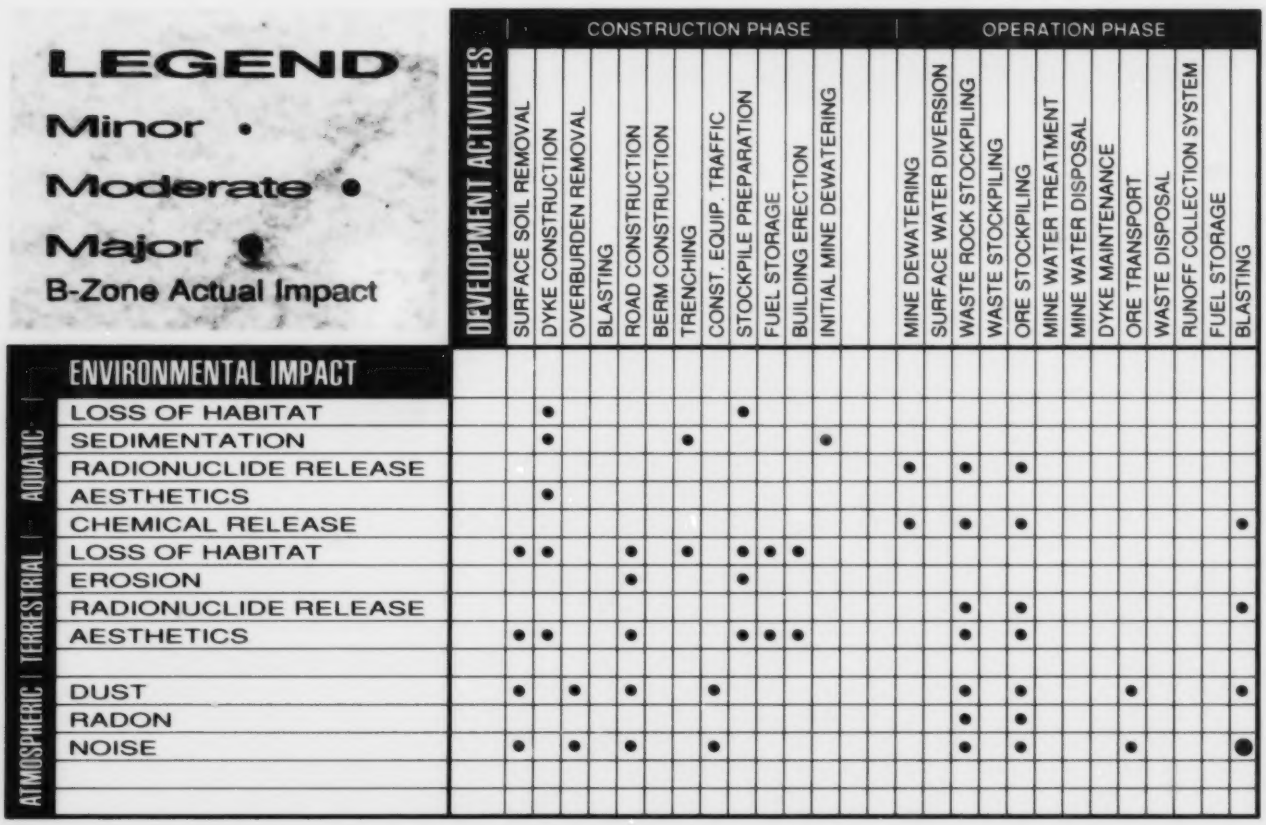
Predicted Impacts of the Developments

Eagle Point

Overall, the environmental impacts of Eagle Point should be less than those of the B-zone operation, because predicted mine-water volumes are smaller, the mine water and effluent would be cleaner, ultimately all waste rock would be returned underground as back-fill, and the area of disturbance would be smaller.

Following the same procedures as for the B-zone development, the potential impacts of the new developments have been predicted. The facilities required for

Figure 7



Eagle Point are shown in Table 2 and the predicted impacts are shown in Figure 8. The construction phase impacts of Eagle Point have already been experienced, since the construction is nearly complete.

Impacts on water are related to the discharge of mine water and treated effluent and are predicted to be minor. Because the Eagle Point ore does not contain the nickel and arsenic found in the B-zone ore, all waste waters should be cleaner and have smaller impacts.

Because Eagle Point is an underground mine, the impacts on land use are smaller than would be experienced for an open pit operation. All impacts are predicted to be minor. There will be a small loss of habitat during the operation, but this loss will be restored by decommissioning. It is expected that wildlife will avoid the area during the operation, but there will be no effect on wildlife population.

Impacts on air quality are also predicted to be minor. These result from dust, created from ore handling, and radon emissions, chiefly from the mine ventilation system. Experience with the B-zone operation suggests that dust will not be a significant problem. Both past monitoring experience and air dispersion modelling suggest that radon levels would not be measurably different from natural background at further than a few kilometres from the source.

The environmental impacts during production will be the same as those experienced from the construction phase, but will be extended over a longer time. All impacts are predicted to be minor.

Figure 8

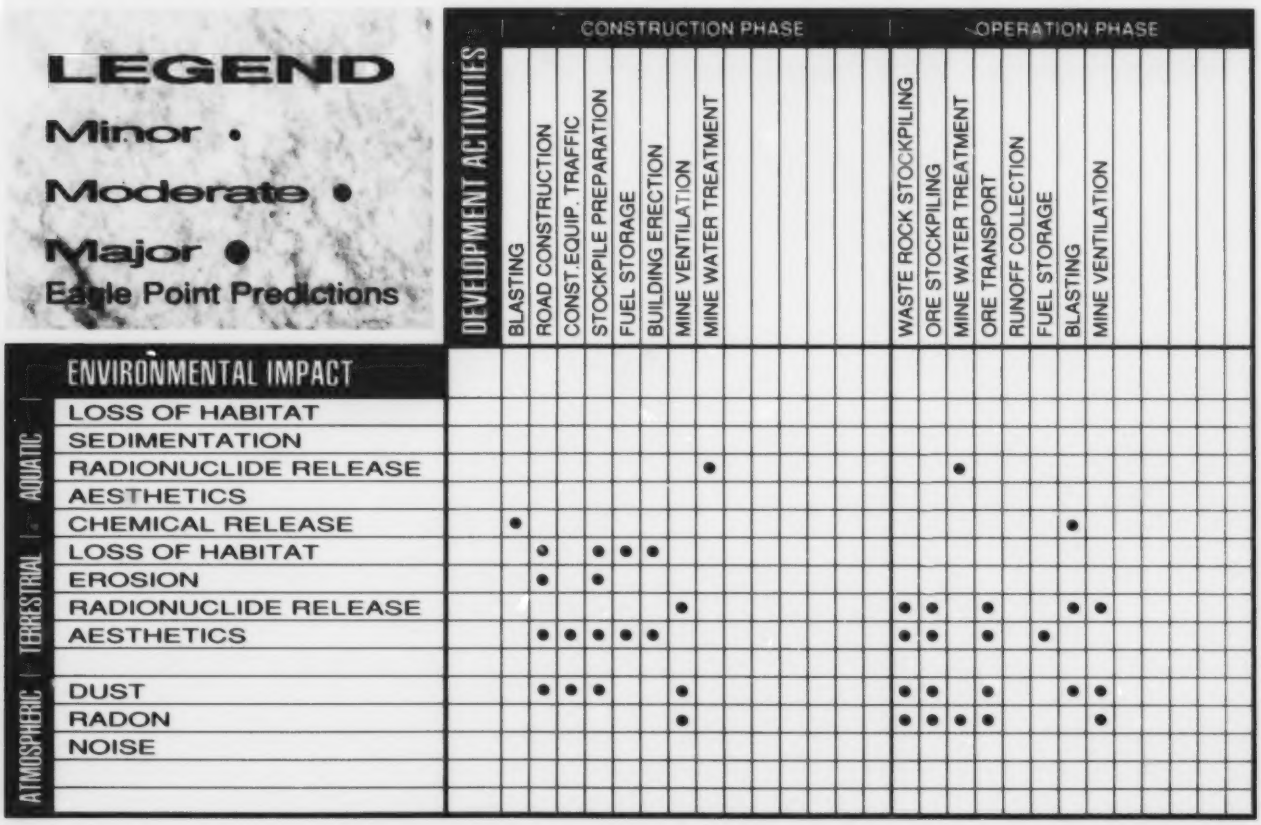


Table 2: Facilities Required for Eagle Point

Facility	Construction Phase / Test Mine	Operation Phase / Production Mine
access road	4 km extension (12 m wide)	upgrade to 19 m wide
mine dewatering	4 km pipeline extension and pumping facilities	use extended pipeline and pumping facilities
heating plant	1	2 additional
power supply	2.1 km transmission line extension	use extended line
fuel storage	not required	tanks at Eagle Point
mine access	ramp development	use existing ramp
ventilation	1 exhaust and 1 fresh air raise	add 1 exhaust and 2 fresh air raises
dry	●	optional
lunch room	Eagle Point Area	underground
maintenance shop	●	●
fresh water supply	build pump house	use existing pump house
mine water treatment and disposal	●	●
waste stockpile	develop pad	expand existing pad
ore stockpile	develop transfer pad	use existing transfer pad
ore transport	●	●
milling	●	●
waste management	●	●

● Indicates operation will use existing licensed facilities

A-zone and D-zone

The predicted impacts of A-zone and D-zone are similar to those experienced from B-zone, but should be on a much smaller scale, particularly since the two new developments will use some of the B-zone facilities. The additional facilities required for A-zone and D-zone are shown in Table 3 and the predicted impacts are shown in Figure 9.

During construction, minor impacts on the bay are predicted, arising from dyke construction and dewatering, including a very small loss of habitat (less than 1% of available habitat in Collins Bay).

Because A-zone and D-zone are largely under water, the loss of land habitat will be very small and chiefly due to the extension of the haul road. All land impacts are predicted to be minor.

Impacts due to dust and noise are predicted, but because of the small scale of the two new pits, these impacts will be minor and much less than those of B-zone.

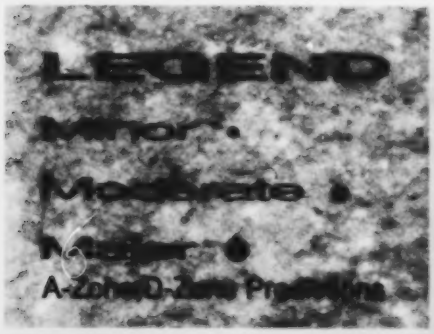
During production, impacts are similar to those of construction, but with fewer impacts on the bay. With the exception of blasting noise, all impacts are predicted to be minor. Because blasting is heard at Wollaston Lake under some circumstances, it has been classified as a moderate impact. Obviously, it will be of only temporary duration.

Figure 10 and Table 4 give a brief comparison of A-zone and D-zone with B-zone. The ore bodies are all very similar with respect to type of ore, location and proposed mining method. Because of the small size of the two new ore bodies, they will be mined out in about six months each, in all about one-sixth of the time taken to mine B-zone. The dyke designs are similar to B-zone, with larger cells and differing numbers of cells, but the volume of fill required for each dyke is less than that used for B-zone. The combined area of the two new pits will be only a fraction of the area of the B-zone pit and the combined final pit volume will be only one-seventh of the volume of B-zone. Clearly the scale and duration of the A-zone and D-zone operations will be much less than those of B-zone, and the overall impacts can be expected to be proportionately less.

Table 3: Facilities Required for A-zone and D-zone

Facility	D-zone	A-zone
Construction Phase		
access road	150 m upgrade	600 m upgrade
dyke	steel cells	steel cells
initial mine dewatering - uncontaminated - contaminated	discharge to Collins Bay 150 m pipeline extension	discharge to Collins Bay 600 m pipline extension
overburden removal	1.2 hectares	1.6 hectares
Operating Phase		
power supply fuel storage dry lunch room maintenance shop waste stockpile ore stockpile ore transport milling waste management mine water treatment and disposal	Use existing licensed facilities	Use existing licensed facilities

Figure 9



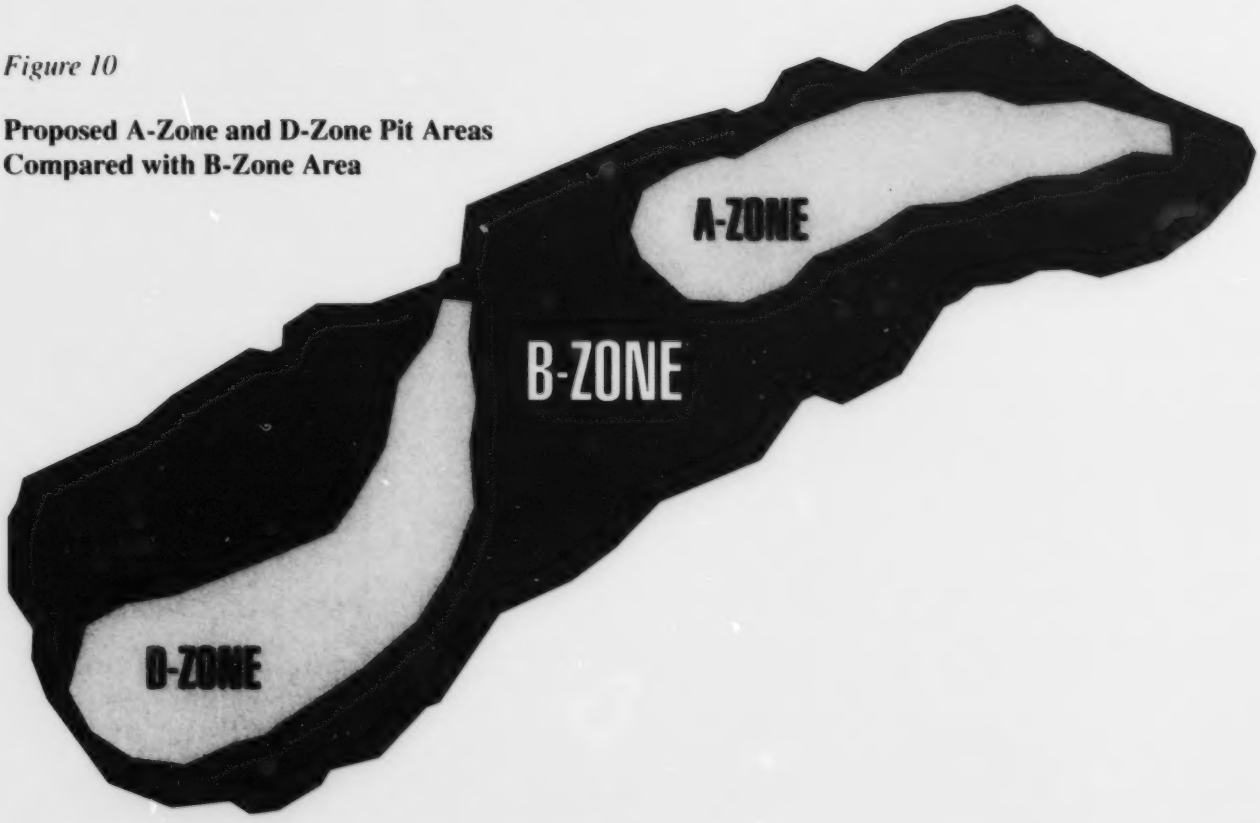
ENVIRONMENTAL IMPACT	SURFACE SOIL REMOVAL	DYKE CONSTRUCTION	OVERBURDEN REMOVAL	ROAD CONSTRUCTION	TRENCHING	EQUIPMENT TRAFFIC	INITIAL DEWATERING	WASTE ROCK STOCKPILE	ORE STOCKPILE	MINE WATER TREATMENT	DYKE MAINTENANCE	ORE TRANSPORT	RUNOFF COLLECTION	BLASTING
AQUATIC / LOSS OF HABITAT		•												
AQUATIC / SEDIMENTATION		•					•							
AQUATIC / RADIONUCLIDE RELEASE								•	•	•				
AQUATIC / AESTHETICS		•												
AQUATIC / CHEMICAL RELEASE								•	•	•				•
TERRESTRIAL / LOSS OF HABITAT				•										
TERRESTRIAL / EROSION				•										
TERRESTRIAL / RADIONUCLIDE RELEASE								•	•					•
TERRESTRIAL / AESTHETICS				•		•		•	•					
ATMOSPHERIC / DUST			•	•		•		•	•			•		•
ATMOSPHERIC / RADON								•	•			•		
ATMOSPHERIC / NOISE			•	•		•		•	•					●

Table 4: Comparison of B-zone, A-zone and D-zone Pits

	B-zone	A-zone	D-zone
Operating Life (mo)	70	6	6
Fill required for dyke (m^3)	160,000	140,000	65,000
Final pit area (ha)	40	4	5
Final pit volume (m^3)	6,000,000	340,000	490,000
Expected uranium production (million lb U_3O_8)	37	16.9	5.6

Figure 10

Proposed A-Zone and D-Zone Pit Areas Compared with B-Zone Area



HEALTH AND SAFETY

The Rabbit Lake Safety Department conducts training, performs safety inspections, performs industrial hygiene sampling, operates the radiation protection programme and maintains emergency teams prepared to deal with mine accidents, fires, chemical spills and transportation accidents. There are health centres at the mill and the camp and a first aid room at the B-zone service building. An occupational health nurse is always on site and a majority of employees have some level of first aid qualification. A medical surveillance programme and a hearing conservation programme are in place. The Occupational Health and Safety Committee, comprised of workers and supervisors, meets regularly and conducts safety inspections.

Rabbit Lake Operation has demonstrated a commitment to safety which has resulted in a steadily improving record over the past ten years. This has produced two mining industry awards for safety, the Ryan Trophy for Western Canada in 1987 and for all of Canada in 1989.

Although Rabbit Lake was mining the B-zone open pit when these awards were won, Cameco has had considerable past experience in underground mining. One of its founding companies, Eldorado, operated the Beaverlodge Mine near Uranium City for 29 years. More recently Cameco operated the Star Lake and Jasper gold mines in northern Saskatchewan. That same safety attitude which made B-zone mining such a safe operation will prevail through the mining of Eagle Point.

In uranium mining, workers can be exposed to several types of radiation: radon daughters and dust in the mine air and direct gamma radiation from the ore itself. In open pit mines air-borne radioactivity is not a problem because of the natural ventilation. In an underground mine, there is potential for significant exposure to radon daughters and good ventilation is used to control this problem.

As with general safety, Rabbit Lake has achieved a downward trend in radiation exposures over the years of operation despite processing an increasing grade of ore. The same approaches as were used in mining B-zone will keep radiation exposure under control at A-zone and D-zone.

Table 5: Estimated Annual Radiation Exposures

A-zone and D-zone Mining

Task	A-zone	D-zone
Truck Driver	6.0	1.3
Blaster	**15.0**	**3.2**

Eagle Point Production

Task	Gamma	Radon Daughters	Dust	Total
LHD/Truck Operator	4.5	0.6	8.5	13.6
Stope Driller/Helper	**0.5**	**1.9**	**8.5**	**10.9**
Radiation Surveyor	4.5	1.0	5.5	11.0
Underground Geologist	**3.0**	**1.8**	**5.5**	**10.3**
Mechanical Maintenance	3.0	0.4	5.5	8.9

The problems are more complex in underground mining, but techniques for mining the Eagle Point ore body are being developed to maintain radiation exposures as low as reasonably achievable, economic and social factors being taken into account. Estimates have been made of the radiation exposures expected in mining the new ore bodies, based on experience with B-zone, Key lake and underground development work (Table 5). These estimates show that personnel will be well below the current Canadian regulatory limits (50 mSv and 4 WLM). It is recognized that new international recommendations are likely to result in more stringent Canadian regulations, but the same estimates show that the operation will be able to comply with the new requirements.

DECOMMISSIONING

Rabbit Lake Operation has recent, relevant experience in decommissioning the B-zone open pit mine. The decommissioning approach for B-zone was developed after study of other open pit decommissioning programmes, leach studies of B-zone waste rock, and extensive environmental modelling of various alternatives. The special waste (mineralized material below ore grade) from B-zone was returned to the bottom of the pit and covered with compacted till, and the pit was flooded with fresh water from Collins Bay. Water quality monitoring will continue for several years before making a final decision on breaching the dyke. At the same time

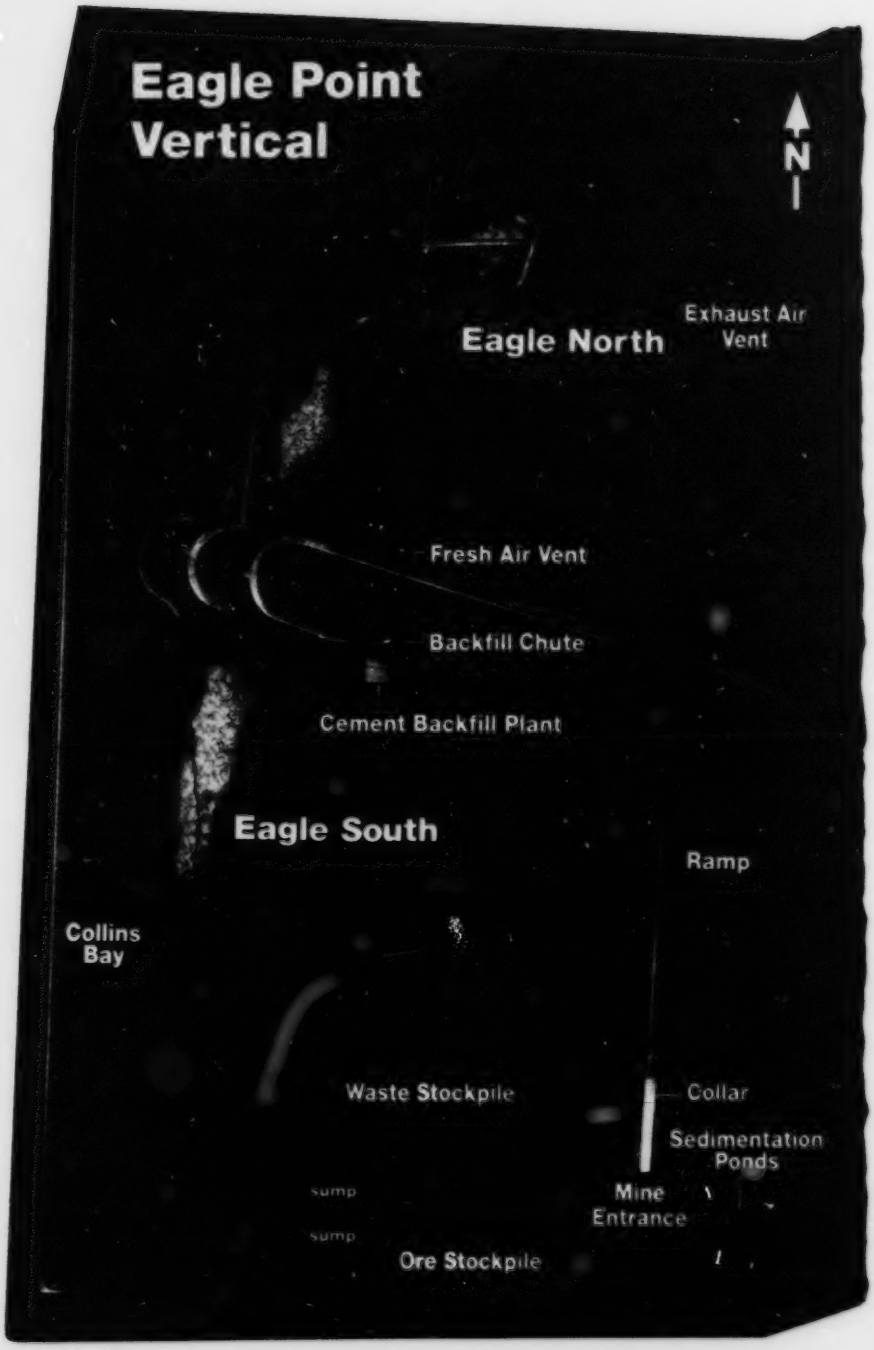


Figure 11

additional waste rock studies are being done. It is expected that the A-zone and D-zone pits would be decommissioned by the same method used for B-zone. By the time these pits are ready for decommissioning, considerable monitoring data will be available on the B-zone pit, which will allow the employment of any refinements to decommissioning techniques, which may be indicated.

Eagle Point, being an underground operation, has much less surface disturbance than an open pit. The company has past experience in decommissioning both a large underground uranium mine (Beaverlodge) and two small underground gold mines (Star Lake and Jasper). Similar approaches will be employed at Eagle Point. All useful equipment will be salvaged, all surface structures will be removed, all mine openings will be sealed, and the surface will be contoured to conform with the existing landscape (Figures 11 and 12). The decommissioning of the production mine would, in some respects, be simpler than the decommissioning of the test mine, because the back-fill required for the production stopes is expected to consume all of the waste rock produced during the development and test mining phase. Although every effort will be made to leave the site in a safe and environmentally benign condition, it must be recognized that it will bear the imprint of human activity for many years.

After all tailings have been deposited in the Rabbit Lake pit, the tailings will be allowed to consolidate until the pore-water pressure within the tailings mass has dissipated. The surface of the tailings will

Figure 12

be covered to complete the "pervious surround" envelope and the pumps will be shut down to allow Rabbit Lake to re-fill (Figure 5). At this point water will tend to flow in the envelope around the tailings, rather than through the tailings. With no water moving through the tailings, the major driving force to move contaminants out of the tailings will be eliminated. The modelling shows that Rabbit Lake will always meet the water quality objectives after closure.

SOCIO-ECONOMIC IMPACTS

The socio-economic impacts of the Rabbit Lake Operation may be separated into two broad categories: the concerns which might arise from the intrusion of an industrial operation into a wilderness area and the positive economic impacts which arise from the employment opportunities, the direct and indirect expenditures and the tax and royalty revenue generated.

Local Concerns

The nearest community is the combined Hatchet Lake Indian Band and Wollaston Lake hamlet, 35 km away on the east side of Wollaston Lake. It has been almost 20 years since the initial construction of the Rabbit Lake Operation. During this time there has been ample opportunity to monitor the environmental effects and assess their importance with respect to impact on the local population.

Concerns have been expressed that the operation of the mine may be endangering the fishing in Wollaston Lake and that the mine may be driving the caribou from their natural range. The environmental monitoring programmes have shown that local waters are not being affected by the mine. There is no evidence of any change in radionuclide or heavy metal concentrations in bottom sediments, aquatic plants or fish. An independent examination of the effects of the operation on Wollaston Lake was conducted by a consulting firm after ten years of operation. This study concluded that the discharges from the operation had no discernible effect on the waters of Hidden Bay and that even persons taking all their drinking water and fish from the bay would not receive any unacceptable radiation doses. Revenue from commercial fishing of Wollaston Lake has varied greatly from year to year. However, Freshwater Fish Marketing Corporation personnel have no record of any species of fish from Wollaston Lake being refused by a buyer. Other factors not related to the mine have contributed to the low revenue in some years.

A study of caribou migration, commissioned by Saskatchewan Environment in connection with the construction of the power line from Uranium City, indicated that north-eastern Saskatchewan is at the western fringe of the Kaminuriak herd migration and that this herd had not entered the province since at least 1973. The Beverly herd regularly enters northern Saskatchewan, but very rarely moves south of the Fond du Lac River. The last major migration south was in the winter 1979-80, when part of the herd moved as far south as Cree and Wollaston Lakes. In 1992 the migration reached Charcoal Lake, about 85 km north of the hamlet of Wollaston Lake. The conclusion is that the mine is not having any influence on the caribou migration.

It is well known that caribou flesh contains elevated concentrations of uranium-chain radionuclides. This results from the consumption of lichen, which accumulates radionuclides from the decay of naturally occurring radon in the atmosphere. The Rabbit Lake lichen sampling programme has shown measurable increases in some radionuclides near the mine site, but a study of the impact of this on the lichen-caribou-human food chain shows that even persons eating only caribou which had grazed for the winter near the mine site would not receive unacceptably high radiation doses. Since caribou visits to the Wollaston Lake area are rare, this is clearly a very conservative assessment.

The operation of the mine and mill has resulted in some loss of terrestrial habitat, but there is nothing unique about the local habitat and it is home to no rare or endangered species. It can be expected that wildlife will avoid the immediate area of the operation, but this does not pose any threats to the local wildlife population. One trapper has complained of the loss of a portion of his traditional trap-line, because the mine occupies part of it, but a compensation agreement has been reached with him.

Economic Impacts

In meetings in northern communities, there is one recurring theme,– Northern residents want to derive more benefits from the northern mining developments. Direct economic benefits can arise from employment and from mine purchases from local businesses. Indirect benefits arise from the stimulation of the local economy and from the availability of services which would not exist in the area if the mine were not there.

Since the start-up, Rabbit Lake has endeavoured to promote northern employment at the mine. Steady improvements have been made in the percentage of Residents of Saskatchewan's North (RSN) employed at the site (Figure 13).

Rabbit Lake was the first mine in northern Saskatchewan to use the fly-in commuter system. The small, widely scattered population, with no road network, made more conventional approaches to employment impractical. The commuter system also avoided the establishment of a single-industry town, entirely dependent upon the mine. The closure of a mine can mean severe economic dislocation for such a town.

The majority of the residents of northern Saskatchewan are of aboriginal ancestry. Although there is a desire to continue the traditional lifestyle, the growing population is straining the resource base. The fur trade, which has been seen as a principal source of income in the past, is rapidly becoming non-viable because of the loss of the European market. The commuter system allows aboriginals to participate in the mining industry, generating some much-needed revenue, while still maintaining elements of the traditional lifestyle.

In the four years since its formation, Cameco has constantly striven to increase northern participation in its mining operations. The percentage of RSN employed at Rabbit Lake has been increased from about 25% to over 40% since 1988 and Cameco has set an objective of 50% RSN employment at its northern mine sites by 1995. This 50% objective is also applied to each contractor working at Cameco's northern sites. The biggest impediment to achieving this objective is lack of education and training in the northern population. To overcome this lack, Cameco, individually and in partnership with Uranerz and others, has undertaken a number of programmes to keep northerners in school longer and to train those who have left school so that they may qualify for better-paying, higher-skilled jobs. These programmes include the Athabasca Awards for grades seven to twelve, Northern Scholarships for university and technical school, Northern Student Summer Employment, Athabasca Innovations for adult academic upgrading, Mill Operator Pre-employment Training, employee training programmes, the Wollaston Lake Training Centre and the PALS Computer Literacy Training Programme.

Since start-up, Rabbit Lake has paid about $37,000,000 to RSN, of which about $31,000,000 have been paid to employees who have continued to be resident in the north. The 1992 RSN payroll is about $3,600,000 and, when contractors are included, the payroll approaches $5,000,000. As the 50% RSN objective is approached, this benefit will continue to increase to about $7,000,000 per year.

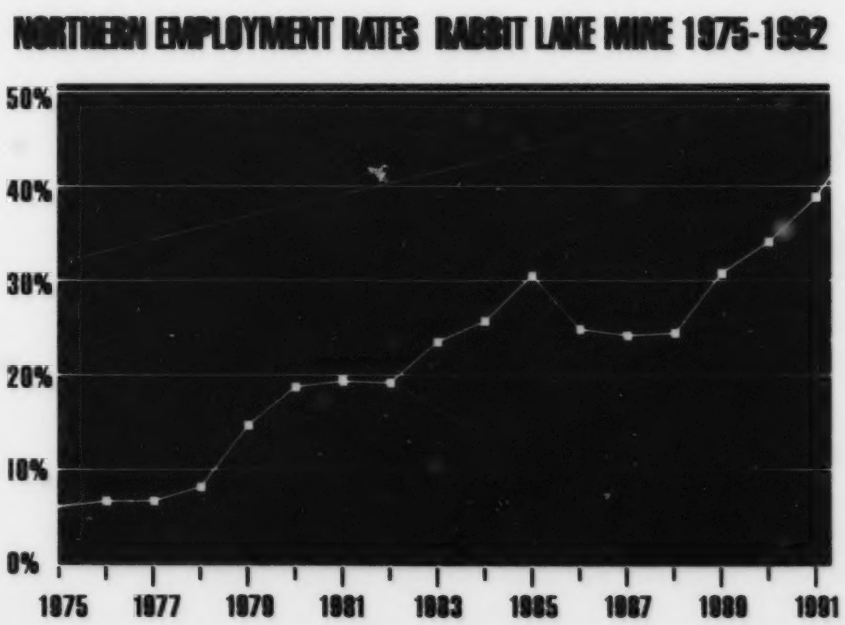


Figure 13

Rabbit Lake Operation has a policy of purchasing goods and services from northern businesses to the extent possible. In some cases Cameco has promoted the formation of partnerships between aboriginal companies and established business people to supply particular services such as trucking and catering for northern operations. In 1991, Rabbit Lake purchased over $3,000,000 worth of goods and services from northern businesses. If the new developments achieve full production, annual purchases from northern businesses are expected to be about 10% of the total or about $4,000,000.

Other benefits which have been realized by northern Saskatchewan as a result of Cameco's presence include the donation of $100,000 to the regional hospital at La Ronge with the potential of another $100,000 when the proposed Contact Lake gold mine is operating, half the cost of a radio transmitter for Wollaston Lake, support for the renovation of the Roman Catholic Mission at Fond du Lac, construction of the power transmission line to Wollaston Lake at a cost of over $1,000,000, development of the Ski-Fit North Programme, and support for the Saskaloppet cross-country ski race.

To improve communication with northerners, Cameco has developed a Northern Community Liaison Committee, with membership from most of the northern communities and senior company management. The committee meets regularly at mine sites and northern communities to discuss matters of mutual interest, including environmental protection, employment and business opportunities.

Virtually all Rabbit Lake employees are Saskatchewan residents and Cameco purchasing policy requires that preference be given to Saskatchewan businesses. If the new development is allowed to proceed to full production, over the minimum estimated operating life of twelve years the following benefits would be realized:

- 335 jobs of which at least half would go to RSN
- creation of approximately the same number of indirect jobs
- direct wages of $13 million per year
- operating expenditures in excess of $1 billion
- royalty payments to the province of $115 to $820 million
- provincial tax payments of $250 to $570 million
- federal tax payments of $240 to $710 million

Impact of Not Proceeding

If the project is not approved for production, upon completion of the test mine, all mining would be shut down. Milling would continue until the B-zone stockpile and the ore from the test mining is exhausted, at which time the site would be decommissioned. This means that the work force would be maintained at present levels for at most another two years, after which only a fraction of the staff would be required for the decommissioning work. Within another five years all jobs would be lost. The impacts from this closure would be:

- the loss of about 335 direct jobs
- the loss of over 3,500 person-years of direct Saskatchewan employment
- the loss of a similar amount of indirect employment
- the loss of over $140 million of direct Saskatchewan wages
- the annual loss of about $4 million of northern business, $20 million of Saskatchewan business and $37 million of Canadian business
- the loss of training opportunities for northerners
- the loss of $350 million to $1.3 billion in Saskatchewan taxes, fees and royalties
- the loss of $200 to $700 million in federal taxes and fees.

CUMULATIVE IMPACTS

In considering cumulative impacts, it is important to remember that the proposed development of A-zone, D-zone and Eagle Point is not an addition to existing mining operations, but rather a continuation to provide a new source of ore to allow existing milling operations to carry on. Without these new ore supplies, the operation will shut down within a few years.

Over the years of operation at Rabbit Lake there have been consistent improvements in environmental control, as demonstrated by the monitoring results. It is anticipated that the emissions to the environment from the proposed production mining will be less than the emissions which have occurred in the past. Even though the total quantity of uranium expected from the new ore bodies exceeds that which has already been produced, the scale of the operations will be smaller and the predicted environmental impacts will be less. Environmental monitoring by Rabbit Lake Operation and special studies by others have demonstrated no discernible impact on local water bodies. The terrestrial impact is limited to the immediate area of the mine and much of this will be mitigated by decommissioning. After decommissioning there will be no constraint on the return of wildlife to the area currently occupied by the mining operations.

Given the facts that no impact on the environment beyond the mine site can be measured after nearly 20 years of operation, that current emissions to the environment are lower than historical emissions, and that predicted impacts from the new operations are smaller than the impacts of past operations, it is concluded that no discernible environmental impact will occur from the production mining of Eagle Point and the Collins Bay A-zone and D-zone ore bodies.